FORM PCT 1390
REV. 5/93

U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NO
WOLFRAMM ET AL-1 (PCT)

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U S APPLICATION NO (if known, see 37 CFR 1 5)
09/889759

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE99/04066	DECEMBER 22, 1999	JANUARY 21, 1999

TITLE OF INVENTION
METHOD FOR INTERFEROMETRIC RADAR MEASUREMENT

APPLICANT(S) FOR DO/EO/US
ARIBERT P. WOLFRAMM AND HELMUT KLAUSING

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. X This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ___ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. X This is an express request to begin national examination procedures (35 U.S.C. 371 (f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
4. X A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. X A copy of the International Application as filed (35 U.S.C. 371(c)(2)
   a. X is transmitted herewith (required only if not transmitted by the International Bureau)
   b. ___ has been transmitted by the International Bureau.
   c. ___ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. X A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ___ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ___ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ___ have been transmitted by the International Bureau.
   c. ___ have not been made; however, the time limit for making such amendments has **NOT** expired.
   d. ___ have not been made and will not be made.
8. ___ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. X An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ___ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. X An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. X An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. X A **FIRST** preliminary amendment.
    ___ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ___ A substitute specification.
15. ___ A change of power of attorney and/or address letter.
16. X Other items or information:

    PCT/ISA/210 - Int'l. Search Report (English)
    3 Sheets of Formal Drawings

Applicant Claims Priority under 35 U.S.C. §119 of Germany Application No. 199 02 007.8 filed January 21, 1999.
Applicant Claims Priority under 35 U.S.C. §120 of: PCT No. PCT/DE99/04066 filed December 22, 1999.

APPLICATION NO. (if known, see 37 CFR 1 5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NO
09/889759	PCT/DE99/04066	WOLFRAMM ET AL-1 (PCT)

	CALCULATIONS	PTO USE ONLY
X The following fees are submitted:		
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Search Report has been prepared by the EPO or JPO..... ....**$860.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) **$690.00**		
Neither international preliminary examination fee paid (37 CFR 1.82) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....**$1,000.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)..... ....$100		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than___ 20 ___ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		

Claims	Number Filed	Number Extra	Rate		
Total Claims	3 - 20 =	- 0 -	X **$18.00**	$	
Independent Claims	1 - 3 =	- 0 -	X **$80.00**	$	
Multiple dependent claim(s) (if applicable)			+ **$270.00**	$	
TOTAL OF ABOVE CALCULATIONS =				$ 860.00	
Reduction by 1/2 for Small Entity status.				$	
SUBTOTAL =				$ 860.00	
Processing fee of **$130.00** for furnishing the English translation later than___ 20___ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$ 860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				See cover sheet attached to assign $ to be charged to Deposit Acct	
TOTAL FEES ENCLOSED =				$ 860.00	
				Amount to be: refunded	$
				charged	$

___ Applicant claims Small Entity status.

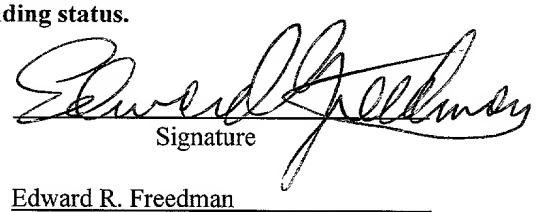
a. X A check in the amount of $860.00 to cover the above fees is enclosed.

b. ___ Please charge my Deposit Account No. 03-2468 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. X The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 03-2468. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:
COLLARD & ROE, P.C.
1077 Northern Boulevard
Roslyn, New York 11576-1696
(516) 365-9802



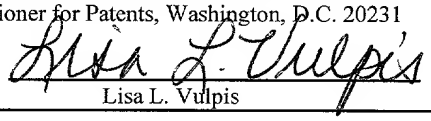
Signature

Edward R. Freedman
Reg. No. 26,048

Express Mail No. EL 769 393 487 US

Date of Deposit July 20, 2001

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10, on the date indicated above, and is addressed to the Ass't. Commissioner for Patents, Washington, D.C. 20231



Lisa L. Vulpis

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: ARIBERT P. WOLFRAMM ET AL-1 (PCT)

PCT No.: PCT/DE99/04066 FILED: DECEMBER 22, 1999

TITLE: METHOD FOR INTERFEROMETRIC RADAR MEASUREMENT

PRELIMINARY AMENDMENT

BOX PCT
Ass't. Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Preliminary to Examination, please amend the above-identified application as follows:

IN THE SPECIFICATION:

Page 1, after the title please insert:

--CROSS-REFERENCE TO RELATED APPLICATIONS:

Applicants claim priority under 35 U.S.C. §119 of German Application No. 199 02 007.8 filed January 21, 1999. Applicants also claim priority under 35 U.S.C. §120 of PCT/DE99/04066 filed December 22, 1999. The international application under PCT article 21(2) was not published in English.

IN THE CLAIMS

Please amend claim 3 as follows:

3. (Amended) The method according to claim 1, characterized in that the antennas (A1, A1) and the center of the image on the graphics display screen are in a fixed relation to each other.

REMARKS

By this Preliminary Amendment, the multiple dependency of claim 3 has been removed so as to avoid the surcharge associated therewith. No new matter has been introduced. Entry of this amendment is respectfully requested.

Respectfully submitted,
ARIBERT P. WOLFRAMM ET AL

By: Edward R. Freedman
Allison C. Collard, Reg. No. 22,532
Edward R. Freedman, Reg. No. 26,048
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ERF/llv
Enclosure: Exhibit A
EXPRESS MAIL NO. **EL 769 393 487 US**
Date of Deposit: July 20, 2001
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10, on the date indicated above, and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Lisa L. Vulpis
Lisa L. Vulpis

EXHIBIT A

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO
CLAIM 3

3. (Amended) The method according to claim 1 [or 2], characterized in that the antennas (A1, A1) and the center of the image on the graphics display screen are in a fixed relation to each other.

METHOD FOR INTERFEROMETRIC RADAR MEASUREMENT

The invention relates to a method for interferometric radar measurements as defined in the introductory part of claim 1.

Owing to their construction, radar devices are precise range-finding systems, which means that without special measures, a radar device is capable of determining only the distance of a target from the antenna, but not its direction. It is possible to determine only whether or not a target is present within the lobe of the antenna.

Said problem is eliminated to a large extent in conjunction with the ROSAR or Heli-Radar system known until now by using, for example 16 vertically staggered antennas with an antenna opening angle of, for example 2.5°. It is possible with such an system to determine the location of an elevated obstruction etc. within an accuracy of about 2.5° in terms of elevation. However, targets located at the same distance are also in this case displayed in the same antenna in the same image spot.

The azimuthal resolution of the known Heli-Radar system amounts to about 0.2° because of a special signal processing. Reference is made in this connection to the disclosure in DE 39 22 086 C1. However, the direction of an obstruction and thus the location in space at which such obstruction is located can be determined only with the help

of a triangulation, whereby two locally separated radar installations can be employed for said purpose in the simplest case.

However, it is possible also to make use of the properties of a coherent radar system and to carry out a type of triangulation with the help of the phase of the emitted signal. For this purpose, a coherent radar system is employed which coherently transmits a signal via a transmitting antenna and receives the echoes scattered back via two locally separated receiving antennas. A coherent evaluation permits a calculation of the phase difference between receiving signals. The direction from which the scattered echoes are received is determined based on the phase difference. Now, once the distance and direction of an "obstruction" have been computed, its location in space can be determined as well. Said type of three-dimensional determination of a location with the help of a coherent radar system comprised of one transmitting antenna and two receiving antennas is generally referred to as "radar interferometry" and known since a long time. It is employed already for the generation of topographic charts with the help of SAR-systems installed on aircraft, for example by the DOSAR system of the firm Dornier GmbH.

Reference is made in this connection to the following published documents pertaining to the further state of the art:

(a) C.T. Allan, Review Article, Interferometric Synthetic Aperture Radar, in IEEE Geoscience and Remote Sensing Society News Letter, September 1995, p. 6 ff;

(b) S. Buckreuss, J. Moreira, H. Rinkel and G. Waller, Advanced SAR Interferometry Study, DLR Bulletin 94, June 10, 1994, Institut für Hochfrequenztechnik, Oberpfaffenhofen.

The entire prior art known to this date and the state of the art cited above, including the ROSAR principle on which the present invention is based, projects terrain elevations or other elevated obstructions in one plane, so that it is not possible to recognize the elevation of the given obstruction if the reproduced topography of the terrain present is unknown. However, a three-dimensional image is required for controlling flights.

The present invention is based on the problem of proposing on the basis of the ROSAR principle measures that permit a quasi-three-dimensional image representation of terrain and other obstructions.

Said problem is solved with the help of the measures proposed in claim 1 in a surprisingly simple manner. Variations and further developments of the invention are specified in the dependent claims, and an exemplified embodiment of the invention, which is sketched in FIG. 1, is explained in the description. In the drawing,

FIG. 1 shows a schematic representation of an exemplified embodiment with respect to the typical geometry for an interferometric ROSAR system,

FIG. 2 shows a block diagram of the exemplified embodiment according to FIG. 1,

FIG. 3 is a perspective view of the state of the art with respect to the ROSAR principle.

According to the general idea of the invention, the goal is to obtain in conjunction with a helicopter operating according to the ROSAR-system a quasi-three-dimensional radar image representation for flight guidance by associating with a transmitter located on the rotating rotary cross two coherent receiving antennas with receiving channels.

The ROSAR-system employed heretofore is comprised of, for example 16 transmitters and receivers with their channels

for obtaining a three-dimensional image. However, said transmitters and receivers have a directional inaccuracy of about 2.5°. Now, if said ROSAR-system, as mentioned above, is expanded by a highly precise coherent receiving channel, only one transmitter and two coherent receivers instead of the, for example sixteen transmitters and receivers employed until now will be required for obtaining the highly precise three-dimensional radar image. The directional inaccuracy found until now is enhanced by the interferometric principle by about the factor 100.

This is explained in the following description of an exemplified embodiment of the invention, which is sketched in FIG. 1.

A helicopter operating according to the ROSAR principle flies over the surface of the earth at an altitude H. One transmitting antenna and two receiving antennas with associated coherent transmitting and receiving electronics are mounted on the end of the rotating antenna cross. The received echoes are amplified, digitized and processed further.

The distance between said arrangement as described above, which is referred to in the following as the INROSAR-system, and the impact point P, which is located at a relative altitude h, is referred to as R. The distance from the

antenna A1 of the INROSAR-system to the impact point P amounts to R + ΔR and is therefore by a small amount ΔR greater than the distance R to the antenna A2. The difference ΔR between the two distances can be calculated based on the known wavelength λ of the emitted radar signal and the measured phase difference $\Delta\phi$ of the receiving echo of the two coherent receiving channels.

Now, said phase difference $\Delta\phi$ of the receiving echo is in turn calculated based on the images generated by processing the receiving echo. Each of the two images is present in a complex, digital form, i.e. it comprises a real part and an imaginary part, or equivalent: the amplitude and the phase.

Now, the phase difference $\Delta\phi$ follows up to a multiple of π (modulo π) through complex multiplication of the image points of the one image with the conjugated complex image points of the other image, and subsequent formation of the arctangent of the respective real and imaginary parts. The phase difference $\Delta\phi$ is obtained in this way, and by inserting $\Delta\phi$ in equation 1, ΔR is then obtained.

$$\Delta R = \frac{\lambda}{4\pi} \Delta \Phi \qquad (1)$$

The phase centers of the two receiving antennas A1 and A2 are removed by the length B, the so-called base line. The following results from the cosinus theorem and a few simple angle relations:

$$\cos(\theta) = \frac{(R + \Delta R)^2 - R^2 - B^2}{2 \cdot R \cdot B} \qquad (2)$$

After the sight angle θ has been calculated in equation (2), it is now possible to determine the relative altitude h as follows:

$$h = H - R \cdot \cos(\theta) \qquad (3)$$

The altitude h is actually not required in connection with the INROSAR system for representing the image dots on the graphics display screen, but only the sight angle θ is used for calculating the coordinates of an impact point P on the graphics display screen. Furthermore, whether the angle of inclination of the antenna is known or not is unimportant as well because the representation on the display screen is only a relative representation of the image dots with

respect to the vertical line in relation to the base line B of the two antennas A1 and A2. The representation of the image is in fact dependent upon the position of the helicopter, for example due to the pitching; however, the antennas of the INROSAR-system and the center of the image are always in a fixed relation to each other. The altitude h and the angle of inclination α of the antennas are only required if a topographical chart with an absolute altitude H of the area over which the aircraft is passing is to be generated with the help of said INROSAR-system. The formulas specified above are useful also for a consideration of errors, as will be explained in the following.

The errors relevant to the INROSAR-system are the phase noise $\delta\phi$ and the change in the base line B between the phase centers of the antennas A1 and A2. The phase noise is composed of the sum of proportions of the different components. The greatest contributions are supplied by the transmitter, the receivers, the system timer and the noise of the A/D-converter. A typical order of magnitude for the entire phase noise $\delta\phi$ of an INROSAR-system amounts to approximately 5°. The change in the base line between the phase centers of the antennas A1 and A2 may be caused, for example by heating due to the incidence of sunlight rays. 0.001 m is assumed to be a typical value. The various

influences result in a scatter δh of the altitude of the impact point P and thus in a scatter of the sight angle $\delta\theta$.

$$\delta h = \frac{\lambda \cdot R}{4\pi \cdot B} \delta\phi \tag{4}$$

$$\delta h = -R \cdot \tan(\theta) \frac{\delta B}{B} \tag{5}$$

This results in scatter of the sight angle $\delta\theta$ as follows:

$$\delta\theta = \arcsin\left(\frac{\delta h}{R}\right) \tag{6}$$

In conjunction with an exemplified embodiment according to FIG. 1, the helicopter flies in the normal position, which means that the antennas A1 and A2 are positioned vertically one on top of the other. ΔR is determined based on equation (1). The value of the measured phase difference $\Delta\phi$ of the echo from the antennas A1 and A2 is ambiguous and can be determined only down to a value ranging between 0 and

2π. Said ambiguity of 2π has to be determined by means of additional measurements. Suitable for said purpose is a transmitter/receiver complementing the INROSAR conception that is comprises a transmitting/receiving antenna that is sharply focussed in elevation and covers the lower range of the sight angle. The distance to the impact point on the ground can be clearly determined based on the receive echo because of the sharp focussing in elevation of said transmitting/receiving antenna. The INROSAR-system accepts sai distance as a basic value and calculates the further ambiguities based on the rising distance from the continuous phase transitions. The following calculation example supplies the detailed explanations.

The calculation is based on the situation that the helicopter flies in its normal position. This means that the antennas A1 and A2 are vertically arranged one on top of the other.

The following parameters apply:

Parameter	Meaning	Value 1/Value 2
H	flight altitude of INROSAR	100 m
$R + \Delta R$	Distance between impact point P and antenna A1	Example 1: 500.009 m Example 2: 500.09 m
R	Distance between impact point P and antenna A2	500.00 m
B	Base line between the phase centers of the antennas	0.15 m
δB	Error of length of base line B	0.001 m
$\delta\phi$	Phase noise of the INROSAR system	5°
α	Angle in inclination of antennas A1 and A2	90° (vertically)
λ	Radar wavelength	0.0090909

From equation (2) follows:

$$\theta = \arccos\left(\frac{(R + \Delta R)^2 - R^2 - B^2}{2 \cdot R \cdot B}\right) \qquad (7)$$

Example 1

$$\theta 1 = \arccos\left(\frac{(500.009^2 - 500.000^2 - 0.15^2)}{2 \cdot 500.000 \cdot 0.15}\right)$$

$$= \arccos(0.05985)$$

$$= 86.57°$$

$$h1 = 300 - 500.00 \cdot \cos(86.57°)$$

$$= 70.09 \text{ m}$$

Example 2

$$\theta 1 = \arccos\left(\frac{(500.09^2 - 500.00^2 - 0.15^2)}{2 \cdot 500.000 \cdot 0.15}\right)$$

$$= \arccos(0.0599904)$$

$$= 53.14°$$

$$h1 = 300 - 500.00 \cdot \cos(53.14°)$$

$$= 0.048 \text{ m}$$

From the equations (4) and (5) follows for the scatter δh of the altitude h of the impact point P:

$$\delta h_{\delta\phi} = \frac{0.00909 \cdot 500.00}{4 \cdot \pi \cdot 0.15} \; (5°/57.3°)$$

$$= 0.21 \text{ m} \qquad \text{exactly: } 0.210401168 \text{ m}$$

$$\delta h_{\delta B} = -500.00 \cdot \tan(53.14°) \cdot \frac{0.001}{0.15}$$

$= 4.45$ m based on (2): 2.035 - 0.048 m

This results in a scatter of the sight angle $\delta\theta$ as follows:

Due to phase noise, $\delta\phi = 5°$:

$$\delta\theta = \arcsin\left(\frac{0.21}{500.00}\right)$$

$= 0.02°$;

and because of errors in the length of base line B by δB = 0.001 m

$$\delta\Phi = \arcsin\frac{4.45}{500.00}$$

$= 0.5°$.

FIG. 2 shows a block diagram of the exemplified embodiment shown in FIG. 1. Said block diagram is equipped with the components required for the proposed interferometric radar method and requires no further explanations for the expert in the field.

Claims:

1. A method for the interferometric radar measurement in conjunction with a helicopter operating in accordance with the ROSAR principle (Heli-Radar), characterized in that two coherent receiving antennas with receiving channels are associated with a transmitter of the ROSAR system arranged on the revolving rotary cross; and that the difference (ΔR) in the two distances ($R + \Delta R$, R) from the measured impact point P is calculated, in the manner known per se, based on the wavelength λ of the emitted radar signal and the measured phase difference of the receive echo of the two coherent receiving channels.

2. The method according to claim 1, characterized in that for representing the image dots on the graphics display screen in the ROSAR-system, the sight angle (θ) is used for computing the coordinates of the respective impact point (P, Q).

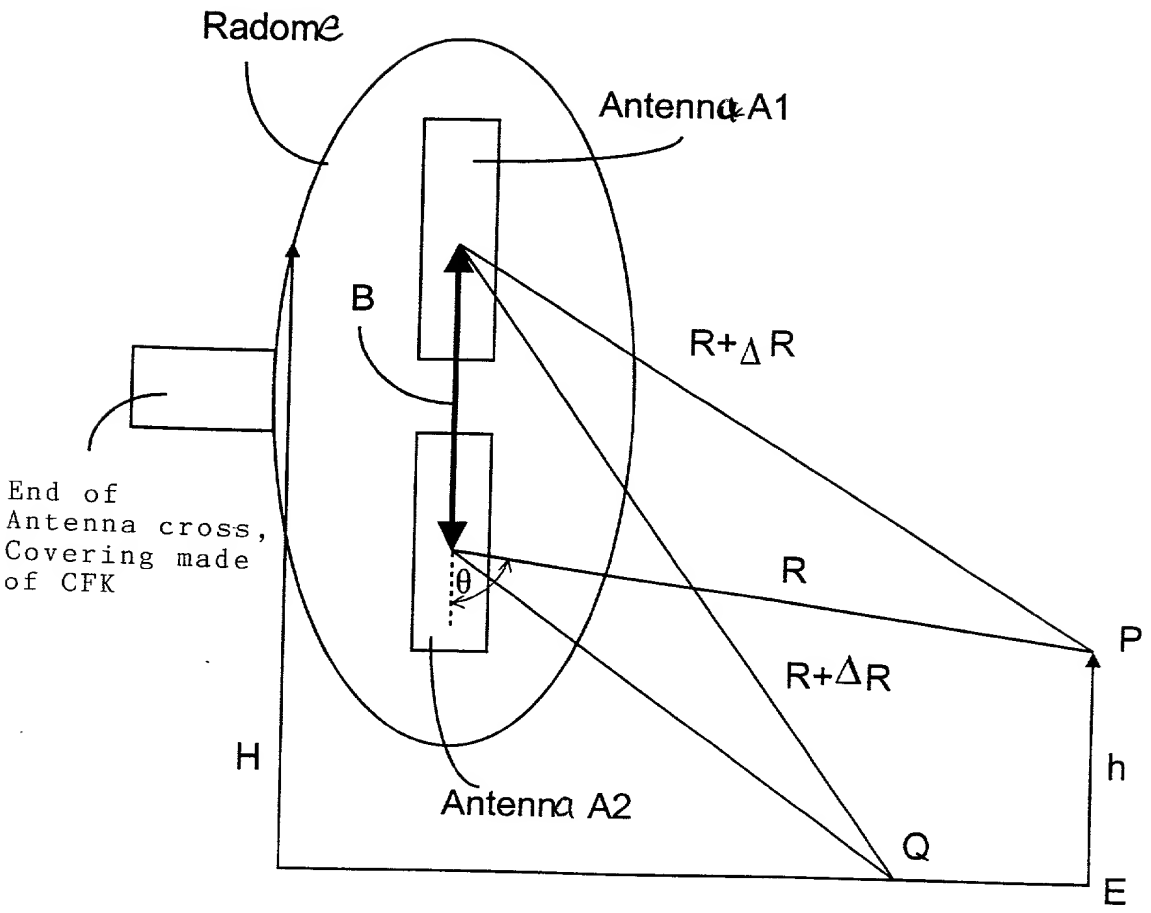
3. The method according to claim 1 or 2, characterized in that the antennas (A1, A2) and the center of the image on the graphics display screen are in a fixed relation to each other.

Abstract

It is proposed in connection with a method for the interferometric radar measurement in conjunction with a helicopter operating in accordance with the ROSAR principle (Heli-Radar) that two coherent receiving antennas with receiving channels are associated with a transmitter of the ROSAR-system mounted on the revolving rotary cross; and that the difference (ΔR) between the two distances ($R + \Delta R$, R) from the measured impact point P are calculated, in the manner known per se, based on the wavelength λ of the emitted radar signal and the measured phase difference of the receiving echo of the two coherent receive channels.

(FIG. 1)

R:\Ingrid\docs\WOLFRAMM ET AL-1 PCT transl


Radome
Antenna A1
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R+ΔR
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Q
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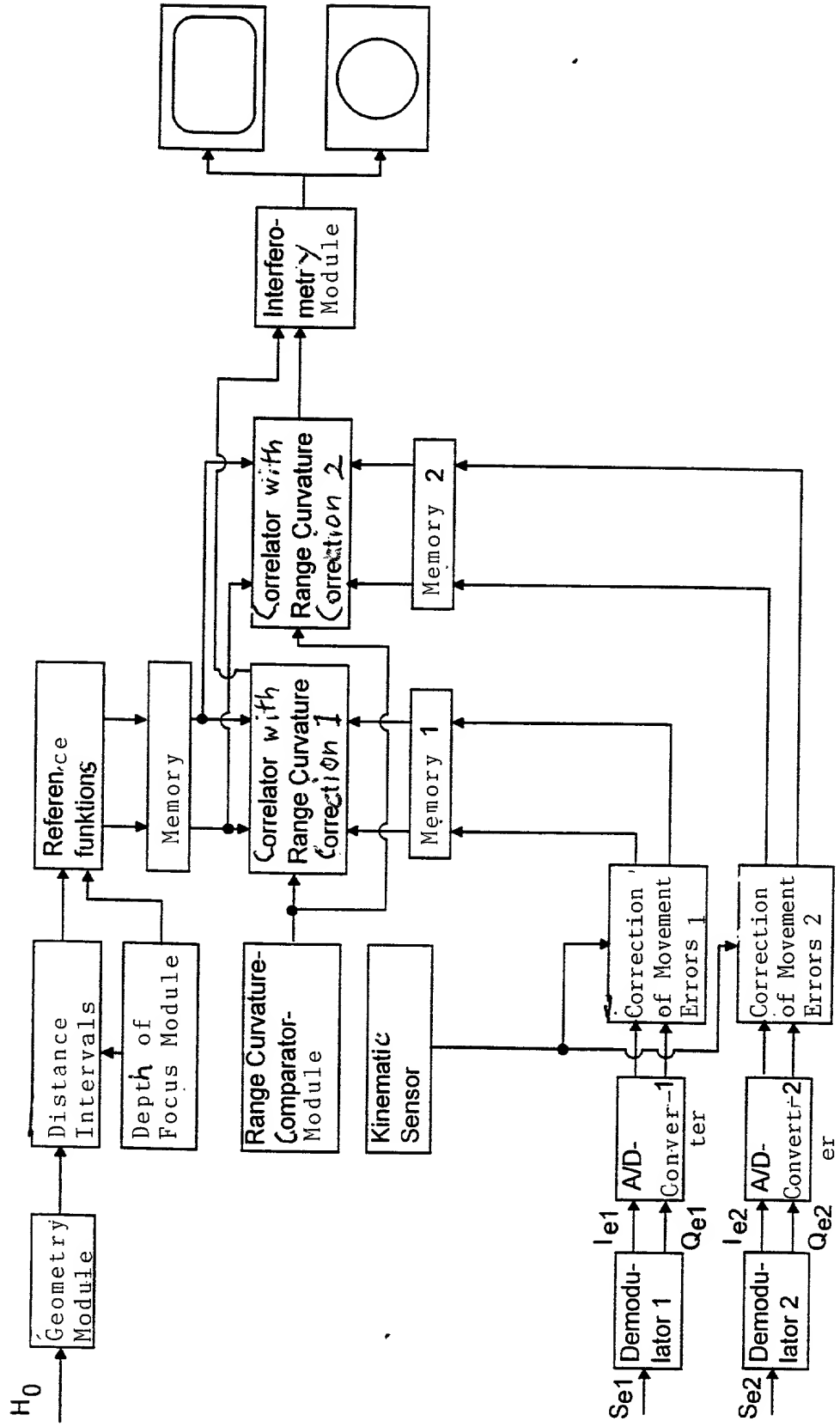
Fig. 1


H0
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Depth of Focus Module
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Range Curvature-Comparator-Module
Correlator with Range Curvature Correction 1
Memory 1
Kinematic Sensor
Correlator with Range Curvature Correction 2
Memory 2
Interfero-metry Module
Correction of Movement Errors 1
Correction of Movement Errors 2
A/D-Conver-ter
A/D-Converter
Demodu-lator 1
Demodu-lator 2
Se1
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Ie1
Qe1
Ie2
Qe2

Fig. 2

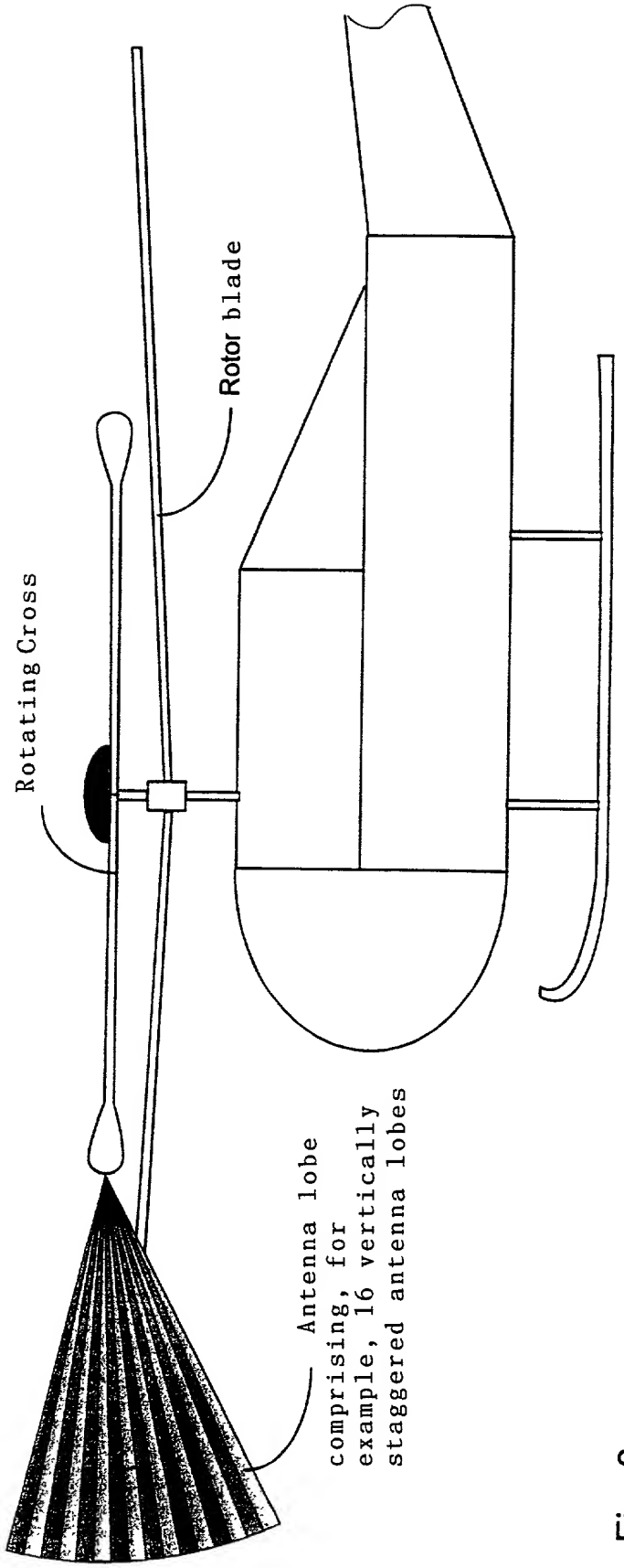
Rotor blade
Rotating Cross
Antenna lobe comprising, for example, 16 vertically staggered antenna lobes

Fig. 3

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (Includes Reference to PCT International Applications)	ATTORNEY'S DOCKET NUMBER WOLFRAMM ET AL-1 PCT

60 90 7316

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD FOR INTERFEROMETRIC RADAR MEASUREMENT

the specification of which (check only one item below):

[ ] is attached hereto.

[ ] was filed as United States application

Serial No. _____

on _____,

and was amended

on _____ (if applicable).

[X] was filed as PCT international application

Number PCT/DE99/04066

on 22 DECEMBER 1999,

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
GERMANY	199 02 007.8	21 JANUARY 1999	[X] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
(Includes Reference to PCT International Applications)

ATTORNEY'S DOCKET NUMBER
WOLFRAMM ET AL-1 PCT

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application Number) (Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclose in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (Check One)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)			

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration numbers): KURT KELMAN, Registration No. 18,628
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201	SIGNATURE OF INVENTOR 202
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DATE 30.6.2001	DATE 5.7.2001